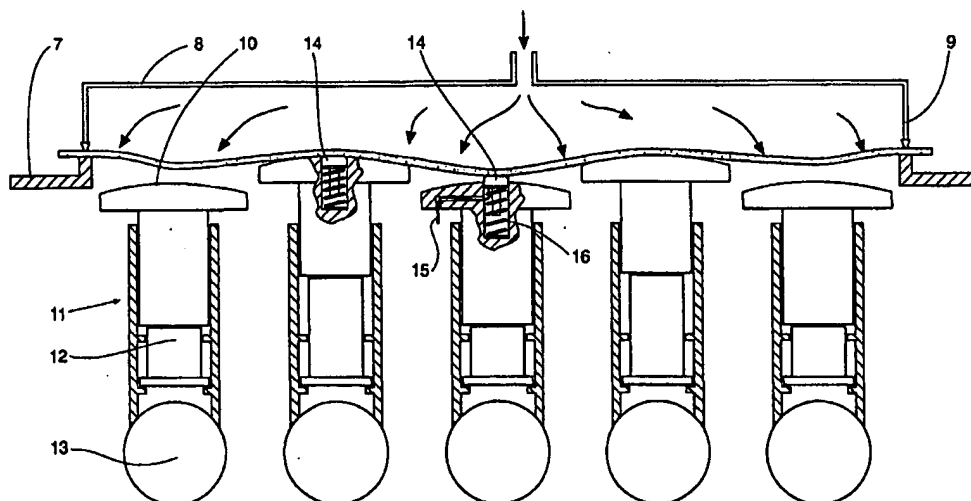




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>C14B 1/10, 1/26, 15/06, 17/04, C14C 15/00</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 98/45483</b> <b>(43) International Publication Date:</b> 15 October 1998 (15.10.98)
<b>(21) International Application Number:</b> PCT/AU97/00262 <b>(22) International Filing Date:</b> 1 May 1997 (01.05.97) <b>(30) Priority Data:</b> PO 5981 3 April 1997 (03.04.97) AU <b>(71) Applicant (for all designated States except US):</b> FUTURE TAN PTY. LTD. [AU/AU]; 55A Main Avenue, Frewville, S.A. 5063 (AU). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> ANDERSON, Colin, Charles [AU/AU]; 55A Main Avenue, Frewville, S.A. 5063 (AU). <b>(74) Agent:</b> COLLISON & CO.; 117 King William Street, Adelaide, S.A. 5000 (AU).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>

**(54) Title:** TREATMENT OF HIDES**(57) Abstract**

Hides are tanned by stretching the hide to open its structure to allow passage of the tanning fluids. The hide is stretched in a frame, and an open chamber is sealed to the periphery of the hide. Fluid pressure within the chamber forces the tanning fluid through the hide. Sensors beneath the hide determine when fluid has passed through the hide. The tanning process is reduced from days to hours.

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## TREATMENT OF HIDES

This invention relates to the treatment of skins and hides including green and dehydrated skins and hides which, for convenience will be called 'hides' throughout this specification.

- 5 The presently used process for treating animal hides so as to produce leather basically involves batch operations in which the hides are immersed successively in different liquids for long periods. This is a time consuming process and large volumes of contaminated spent liquids result, with disposal presenting a substantial problem.
- 10 In the presently used process of tanning a hide there are a number of operations carried out between the dehairing and the tanning as detailed in the accompanying chart forming Fig. 1. One of the main operations is pickling to remove unwanted substances such as proteins since these degrade over a period of time and reduce the quality or value of leather. It has been
- 15 considered essential that mechanical action in the presence of the particular fluid was necessary to work these proteins out of the hide structure when they reacted with the chemicals. To provide this mechanical action, it has been considered to be necessary that the material would need to be subject to soaking and agitation in the conventional manner.
- 20 In patent specification No PCT/AU95/00524 there is disclosed a process involving stretching and tensioning hides in a frame, the hides being passed through successive fluid application processes involving application of treatment fluids to the hide while in the frame and without removing the hide from the frame between successive fluid treatment operations.
- 25 It is an object of the present invention to provide a process and apparatus for the treatment of hides which can be effective and efficient processing operations involving exposure of the hide to treatment fluids.
- It is a preferred object of the invention to provide a hide treatment process and apparatus enabling elimination of at least some batch processing stages
- 30 involving soaking and agitation of hides and the resulting generation of large volumes of liquid requiring subsequent treatment and disposal.

It is a further object of the invention to provide a process and apparatus in which means are provided to facilitate the entry to and passage through the

hide of processing fluids.

It is a still further object of the invention in which the processing fluids are applied to the hide under a differential pressure between the two sides of the hide.

- 5 It is a further preferred object to provide a process and apparatus in which additional hide washing is avoided and/or hide support structures do not require continual maintenance.

- The process according to the present invention for the treatment of hides comprises selecting hides of a predetermined general size range, mounting  
1 0 the selected hide in a stretched condition so that the structure of the hide is opened, the mounting of the selected hide in the stretched condition also configuring the hide so that the size and shape of the selected hide when mounted is known to a predetermined tolerance, engaging sealing means  
1 5 around edge regions of the hide so as to create a chamber with one wall of the chamber being defined by the hide, the chamber being closed by the hide and by the seal formed around the edge regions of the hide, and applying a treatment fluid to the hide with a pressure differential being created between the side of the hide facing into the chamber and the opposite side of the hide so that fluid penetrates into the hide assisted by the pressure differential and  
2 0 thereby treats throughout its thickness in the area defined within the boundaries of the sealing means.

Sheep and cattle offered for sale are drafted for size, weight and condition. This process provides a preliminary grading for skin size. After slaughter, hides are trimmed to shape.

- 2 5 It is therefore possible to take advantage of this uniformity in the processing operation. In mounting hides in the respective tensioning frames stretching takes place when tension is applied. By controlling the tension applied minor variations in size can be adjusted to make them a constant size and shape (to a predetermined tolerance). This may be achieved by locating a hide inside  
3 0 a frame and by moving one or more toggles affixed to an edge of the hide out to a fixed stop where upon the toggle is fixedly located relative to the frame. The skin would therefore be now partially tensioned and of a substantially preselected size and shape.

Further tensioning may take place by pressurising the chamber by each hide

being mounted at its edge regions at a supporting platform or ledge and the application of a pressure medium between the chamber and the surface of hide.

5 The apparatus according to one form of the invention may include a frame including movable toggles to grasp the edge of the hide, means to move the toggles to stretch the hide and selectively operable sealing means to form a seal whereby fluid under a pressure differential applied to one side of the hide penetrates the hide while in the stretched condition

10 In order to more fully describe the invention reference will now be made to the accompanying drawings in which:-

Figure 1 lists the steps in a tanning process,

Figures 2 (a) to (d) show a side elevation of the tensioning and stretching of a hide,

Figure 3 shows a plan view of the hide after tensioning,

15 Figure 4 shows a side view of an individual station prior to pressurisation,

Figure 5 shows a side view after moderate pressure has been applied, and

Figure 6 shows a preferred form of the lifting platforms.

20 Figure 1 shows the successive tanning stages that would be undertaken using the present innovative technology. It is noted however that these basically reflect the current technology in the tanning of hides. However the new technology will decrease the time period significantly at each stage with also a significant reduction in the pollutants produced compared with existing practiced technology.

25 In the process of the present invention a hide is mounted on a stretching frame which frame and hide pass through a series of successive stations where sequential hide treatment operations can be carried out. Each station includes a dome to seal adjacent the periphery of the hide, a fluid pump to supply treatment fluid, means to supply air pressure between the dome and the hide and a waste treatment unit. The frame is preferably mounted on a  
30 conveyor system to transport the individual frames with hide attached through the successive stations from raw hide to wet blue stage (where hides may be

removed if desired) or right through to the finished tan product.

- A shown in Figures 2 and 3 the hide 1 is placed on a table 2 and toggles 3 attached to the periphery of the hide. Each toggle is attached to an hydraulic ram or pneumatic cylinder 4. The table may have radial slots beneath which are the respective pneumatic rams. As shown in figure 2b, a peripheral frame 5 can be lowered into position so as to completely surround the hide. The apparatus has a number of toggles 3 initially radially outwardly displaced from the hide edges but within the frame 5, each toggle having an associated actuator to open and close the toggle which extends downwardly through a respective one of the slots in the support table. The toggles are moved radially inwardly along their respective slots and the toggles attached to the edges of the hide. The actuators and associated toggles may be connected to the respective rams before the hide is placed on the table and the frame is positioned to surround the hide. Alternatively the toggles may be mounted by the frame when it is first located around the hide and the toggles may be connected to the rams by means of the actuators before or after the toggles are move radially inwardly to engage the hide edges. When the toggles are attached to the hide edges and the actuators are connected to the respective pneumatic or hydraulic rms, the position in Figure 2(c) is achieved.
- The rams are then operated so as to move the respective toggles radially outwardly by operating on the respective actuators so that the position in Figure 2(d) is reached in which the hide is tensioned and stretched in all directions.
- Due to the preliminary grading and classification of the animal or hide, the hide will already be within a predetermined general size, and thus the toggles may be moved outwardly to a predetermined fixed position defined by limit stops 6. These stops 6 may be micro switches which ,when contacted by the toggles, stop the outward movement of each respective ram. Thus by providing the limit stops at predetermined fixed positions, hides within a general size range can all be stretched to substantially the same size and shape (within a predetermined tolerance) in spite of normal variations between individual hides. After stretching, the toggles can then be fixed to the frame and the pneumatic rams can be disconnected from the toggles, after which the frame with the hide held stretched therein can be lifted from the support table enabling the hide to then be taken to the next stage for further processing.

Referring now to Figures 3, 4 and 5, there is shown the frame 5 with hide 1 attached positioned over a sealing platform 7 having a hole bounded by edge 7(a). The sealing platform is positioned under the hide and a chamber 8 having an open side is lowered onto the hide to seal on the surface of the hide, the sealing platform supporting the hide against the sealing force of the chamber. The chamber 8 and the sealing platform 7 are shaped, as for example as shown in figure 3, to seal adjacent the edge of the hide so that only a minimum portion of the hide is outside the chamber. The lower edge of the chamber is provided with a seal 9 to seal against the surface of the hide.

As noted above the sealing platform conforms to the known edge shape of the hide of the same general size range to be positioned beneath the edge region of the hide, preferably with a minimum overlap of 15 to 30 mm, the hide thus closing the chamber on one side of the chamber. Thus a pressure differential across the hide can be maintained, and by the application of a positive pressure in the chamber, the required rapid passage of the various chemical fluids into and/or through the hide can be achieved.

During the application of fluid under pressure to the hide, the hide will be further stretched and deflected, and while the hide is supported peripherally, the hide is also supported across its under surface by a plurality of support platforms 10 as shown in Figures 4 and 5 to prevent the excessive bowing and stretching of the hide. However, because the platforms may impede penetration of the treatment fluids into the hide at the areas supported by the platform, various of the platforms are lowered so that they do not engage the hide and other platforms are raised to support the hide at locations other than the areas of the first set of platforms. Thus the platforms are arranged in at least two groups, a first group to initially support the hide and a second group to support the hide at different areas of the hide when the first group of platforms are retracted. This enables all portions of the hide to be effectively treated by the treatment fluid.

Each of the platforms is extended and retracted by an actuator, preferably a pneumatic cylinder 11 having a piston 12 supplied by air through an air supply line 13. The elevation of the platforms can be used to apply additional tension to the hide to open the hide while under the pressure in the chamber, and thus by controlling the extension of the platforms the tension on the hide can be precisely controlled. This provides an additional operating parameter

for the process which can enable monitoring of the treatment process for each individual hide.

5 The edge sealing apparatus can enable very low pressure differentials across the hide, eg. in the order of 1 to 3 psi, and possibly even less, to be used to achieve effective fluid penetration and hence effective hide treatment to be achieved. In fact, very low pressure differentials of this order are believed preferable to higher pressure jets or sprays since it is believed that the high pressure application of fluids becomes counter productive by compressing the tissue structure of the hide, including the microscopic pores and the like through which the treatment fluids permeate the hide. This compression of the tissue structure is believed to inhibit penetration of the treatment fluids.

10 Thus the tensioning can be in two stages, the initial tensioning to size the skin for that particular group of skins, and then the tensioning under pressure as a second stage of tensioning. This second stage is thus controllable and the tensioning can be adjusted for each particular skin, and for various types of skins and varying properties of the skin in particular areas.

15 The seals on the chamber can be changed to provide the most appropriate seal for a particular skin or skins. When the skin is to be affixed to the frame it is inspected and if damaged, the damage can be repaired prior to processing, eg, by the use of staples. Also the inspection can identify strains caused by processing on the slaughter floor. Early identification will facilitate immediate correction. At present strains are not identified for many days thus resulting in downgrading of the hide with consequent loss of value.

20 The design of the support platform will vary and take account of the varying conditions of hide properties in particular areas.

Also precise control of the degree of penetration through the skin is achieved. Sensors are preferably positioned beneath the skin to detect when the treatment liquor has penetrated the skin, so that control of treatment and the supply of liquor can be controlled. Thus as shown in Figure 4 sensors 14 are provided in selected platforms 10, these platforms being those which contact the skin having the greatest thickness, that is those areas along the neck and the back of the animal. The sensors are designed to detect the presence of the treatment fluid passing through the skin, the sensors being connected by leads 15 to an indicator or recorder. Preferably each sensor is spring loaded



by a spring 16 so that the sensor will remain in contact with the skin when the platform is adjusted in height to achieve the desired tensioning of the skin. When the platforms are lowered, the sensors will protrude above the upper surface of the platform and remain in contact with the lower surface of the skin to thus sense the presence of the treatment fluid on the lower surface of the skin. Thus by the use of sensors the whole treatment system can be accurately controlled. As soon as the treatment fluid is detected passing through the skin the pressure in the chamber can be terminated, and the hide then moved from that treatment station to the next treatment station or the hide removed from the toggles, depending upon the stage of treatment of the hide. Thus the whole process can be either manually controlled or automatically controlled by a programmable control system.

Hence it will be seen that the accurately controlled, and each individual hide can be monitored and individually treated. The mechanical tensioning of each batch of hides of similar size hide can be can be adjusted for that batch, or if necessary the mechanical tensioning can on an individual hide basis. Similarly the pressure applied to the pressure chamber can be adjusted for a particular batch of hides, or again individually controlled for selected hides.

Thus it will be seen that with the present invention there is a markedly reduced effluent problem. The liquors are restricted to the chemical uptake of the skin, and there is virtually no chemical excess. As a result there is a markedly reduced water consumption with recycle capability of water and the treatment fluids with minimum effluent treatment required due to the recycle and process monitoring control. At present effluent treatment units are required at each plant, while with the present invention there is no requirement for an external effluent plant.

With small skins, the invention also includes the manual tensioning of the skins before lowering the pressure chamber to seal around the edge of the skin before the application of further tensioning pressure and the application of the treatment fluids by the pressure in the chamber.

Further it is to be noted that the drawings are relatively diagrammatic, and it is also to be noted that provision must be made so that the toggles do not obstruct the lower sealing member 7. Thus, as shown, the lower member may have an upstanding lip 17 or edge on its inner surface against which the sealing member 9 on the chamber would seal, the toggle thus being

positioned outside of the lip.

Also it is to be noted that while the invention is directed to the application of fluid pressure in the chamber, it is to be realised that after tensioning the hide by the toggles to the desired degree, the treatment fluids may be applied by  
5 pressure sprogs to impregnate the hide. The sensors below the hide would then determine when the hide has been successfully treated in various areas, and selected areas may be further treated to ensure a complete treatment of the hide.

10 The fellmongering times and tanning times have been substantially reduced from days to hours with the present process, and in addition the process produces value-added by products such as wool and high purity soluble protein concentrate, together with the recovery of fellmongered hair from bovine hide is also possible.

15 The process is applicable to many forms of hide and skin, including emu hide and thus is not limited to sheep and cattle hides.

While the invention has been described in some detail it is to be realised that the invention is not to be limited thereto, but can include variations and modifications falling with the spirit and scope of the invention.

## CLAIMS

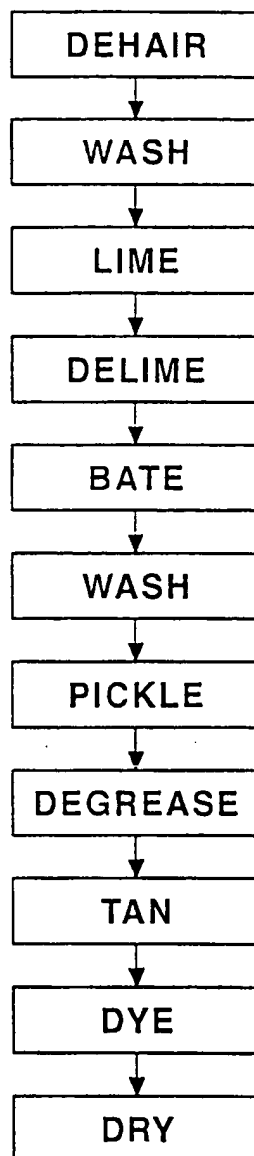
- 1           A process for the treatment of hides comprises selecting hides of  
predetermined general size range, mounting the selected hide in a stretched  
condition so that the structure of the hide is opened, configuring the hide so  
5   that the size and shape of the selected hide when mounted is known to a  
predetermined tolerance, engaging sealing means around edge regions at at  
least one side of the hide so as to create a chamber with one wall of the  
chamber being defined by the hide, the chamber being closed by the hide  
and by the seal formed by the sealing means around the edge regions of the  
10   hide, and applying a treatment fluid to the hide with a pressure differential  
being created between the side of the hide facing into the chamber and the  
opposite side of the hide so that fluid penetrates into the hide assisted by the  
pressure differential and thereby treats throughout its thickness in the area  
defined within the boundaries of the sealing means.
- 15   2.           A process as defined in claim 1 including attaching toggles to the  
periphery of the hide and moving the toggles outwardly of the hide to stretch  
the hide to the configured condition.
3.           A process as defined in claim 1 or 2 including the step of supporting  
the hide while in the stretched condition by a sets of platforms movable  
20   towards and away from the said opposite side of the hide, one set of platforms  
supporting the hide at locations of the hide, moving said one set of platforms  
away from the hide while engaging the other set of platforms to engage and  
support the hide at locations differing from the first set of platforms whereby  
the treating fluids can penetrate all sections of the hide.
- 25   4.           A process as defined in claim 3 wherein the stretching of the hide is  
controlled by variation of the pressure in said chamber and/or the position of  
the support platforms engaging said opposite side of the hide.
5.           A process as defined in claim 4 wherein the hide while in the  
stretched condition is passed sequentially through treatment stations  
30   whereby each treatment station applies a different treatment fluid to the hide.
6.           A process as defined in claim 1 including sensing means  
positioned adjacent said opposite side of the hide to determine the  
penetration of the fluid through the hide.

7. A process as defined in claim 6 including wherein the treatment of the hide is controlled by variation of the mechanical tension applied to the hide, the pressure applied to the hide to increase the tension and the sensing of the treatment fluids passing through the hide
- 5 8. An apparatus for the treatment of hide, which apparatus includes a frame including movable toggles to grasp the edge of the hide, means to move the toggles to stretch the hide, fluid pressure applying means and selectively operable sealing means to form a seal on one side of the hide whereby fluid under a pressure differential applied to said one side of the  
10 hide penetrates the hide while in the stretched condition.
9. An apparatus as defined in claim 8 wherein each of the toggles is separately controlled in its movement by power actuators so that the hide is stretched and configured to its desired shape.
10. An apparatus as defined in claim 8 or 9 wherein the fluid pressure  
15 applying means includes a open sided chamber, sealing means on the edges of the open side of the chamber to seal adjacent the edges of said one side of the hide against a sealing platform and support the hide by its edges, and means to supply a fluid pressure to the chamber whereby by the pressure differential fluid on the one side of the hide is caused to penetrate  
20 the hide.
11. An apparatus as defined in claim 10 wherein the hide is additionally supported by a plurality of support platforms positioned to engage the said opposite side of the hide, the platforms being arranged in sets to engage the hide at different locations, one set only engaging the hide at a particular time  
25 to be replaced by the other set so that all portions of the hide are unsupported at various times to facilitate the penetration of the treatment fluids.
12. An apparatus as defined in claim 10 wherein the movement of the support platforms is controlled to thus control the degree of stretch of the hide.
13. An apparatus as defined in claim 10 or claim 11 wherein each  
30 support platform is individually controlled by a fluid actuated actuator.
14. An apparatus as defined in claim 11 wherein one or more support platforms include a spring loaded sensor adapted to contact the hide when the support platform is positioned against the hide and also the contact the

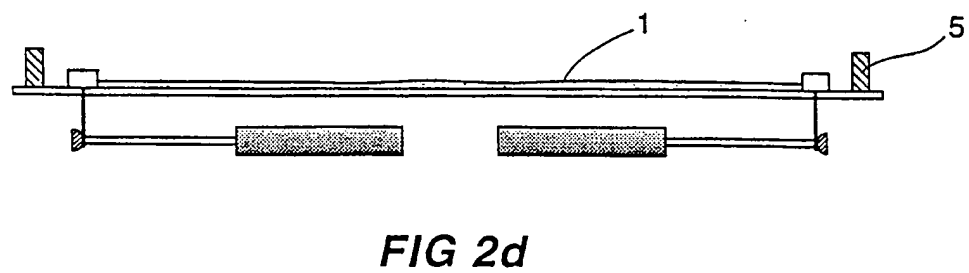
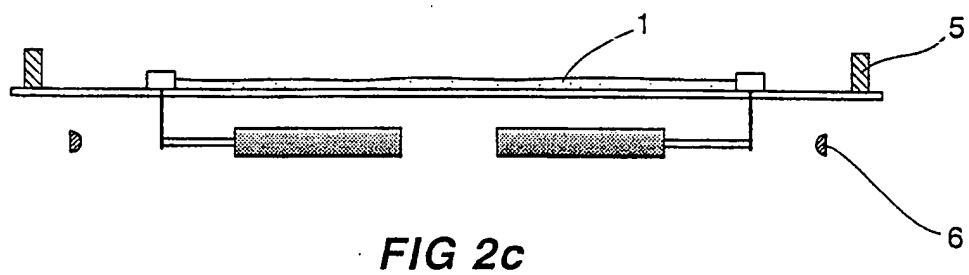
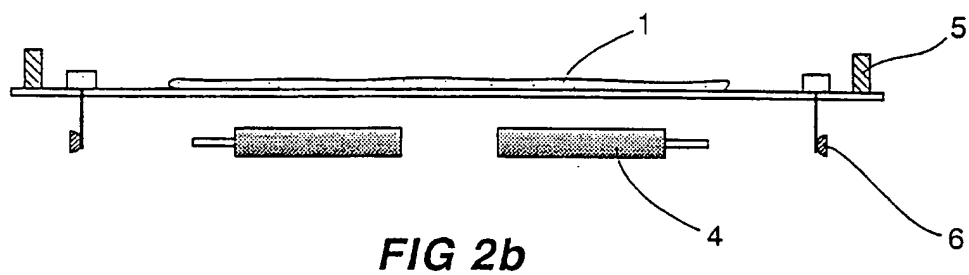
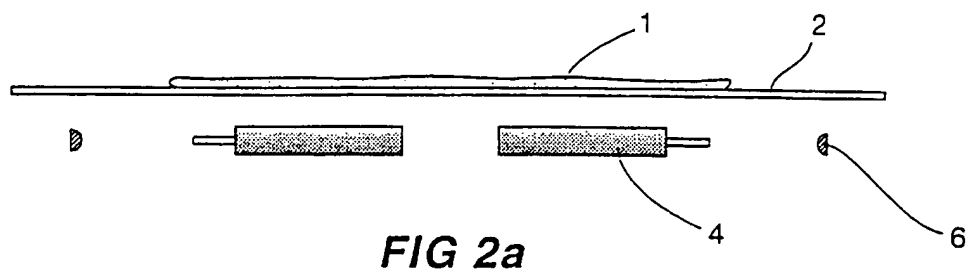
hide when the platform is lowered away from the hide to detect the presence of treatment fluid passing through the hide.

15. An apparatus for treatment of hides substantially as hereinbefore described with reference to the accompanying drawings.

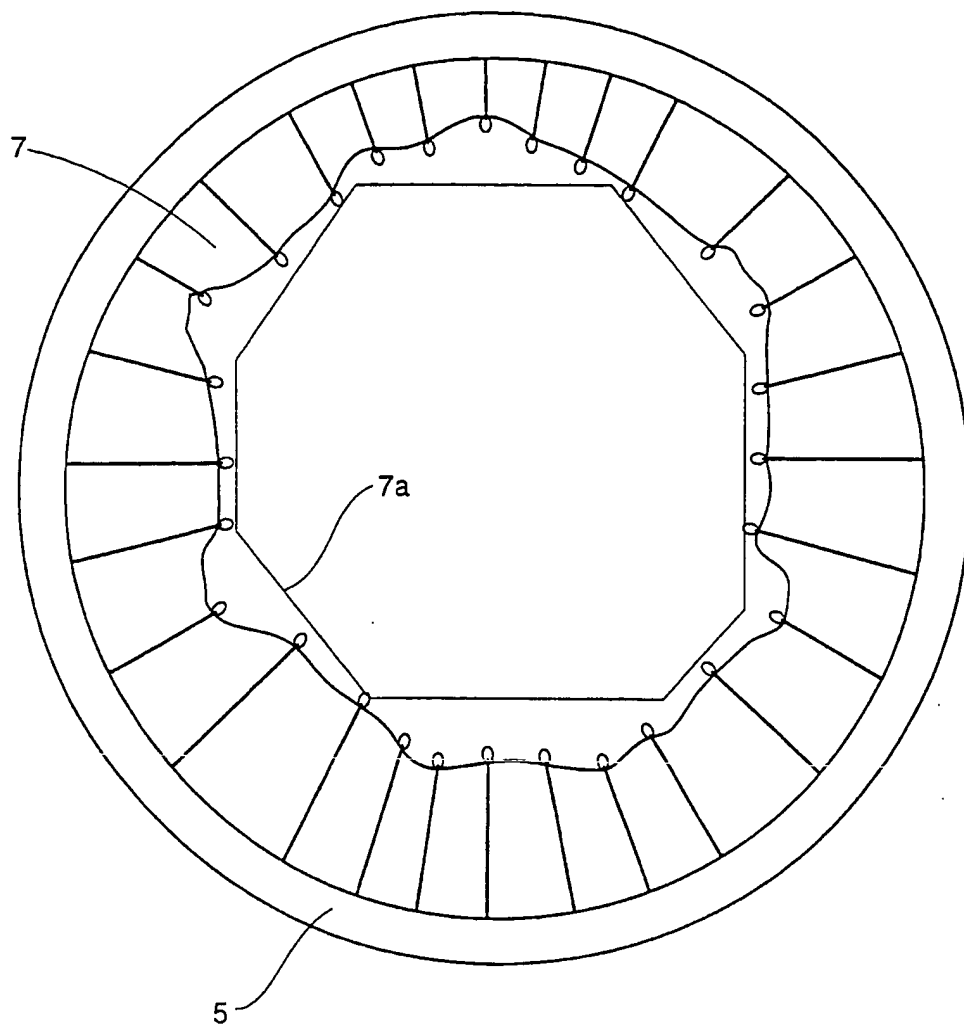
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**FIG 1**

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3 / 6

**FIG 3**



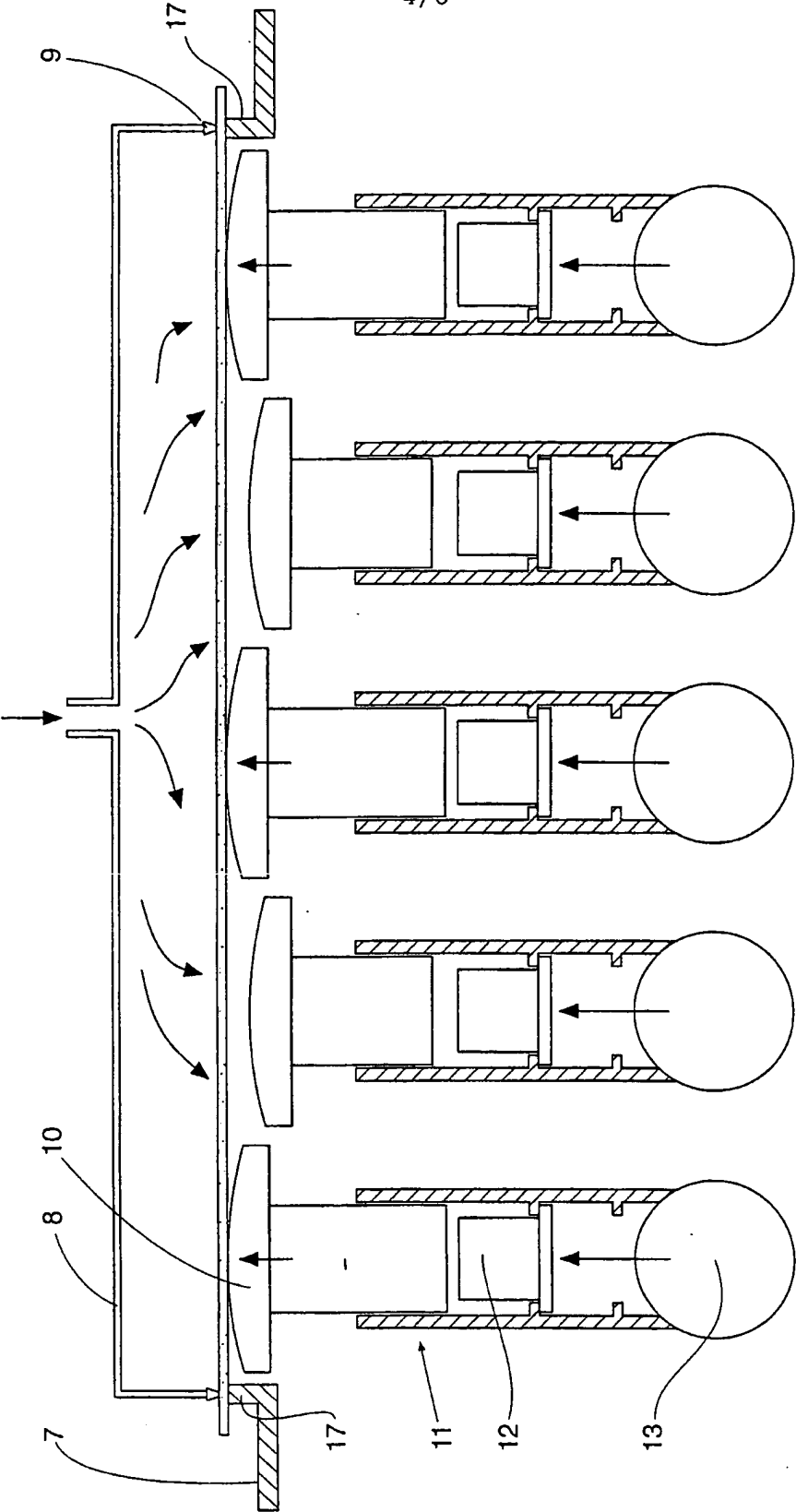


FIG 4

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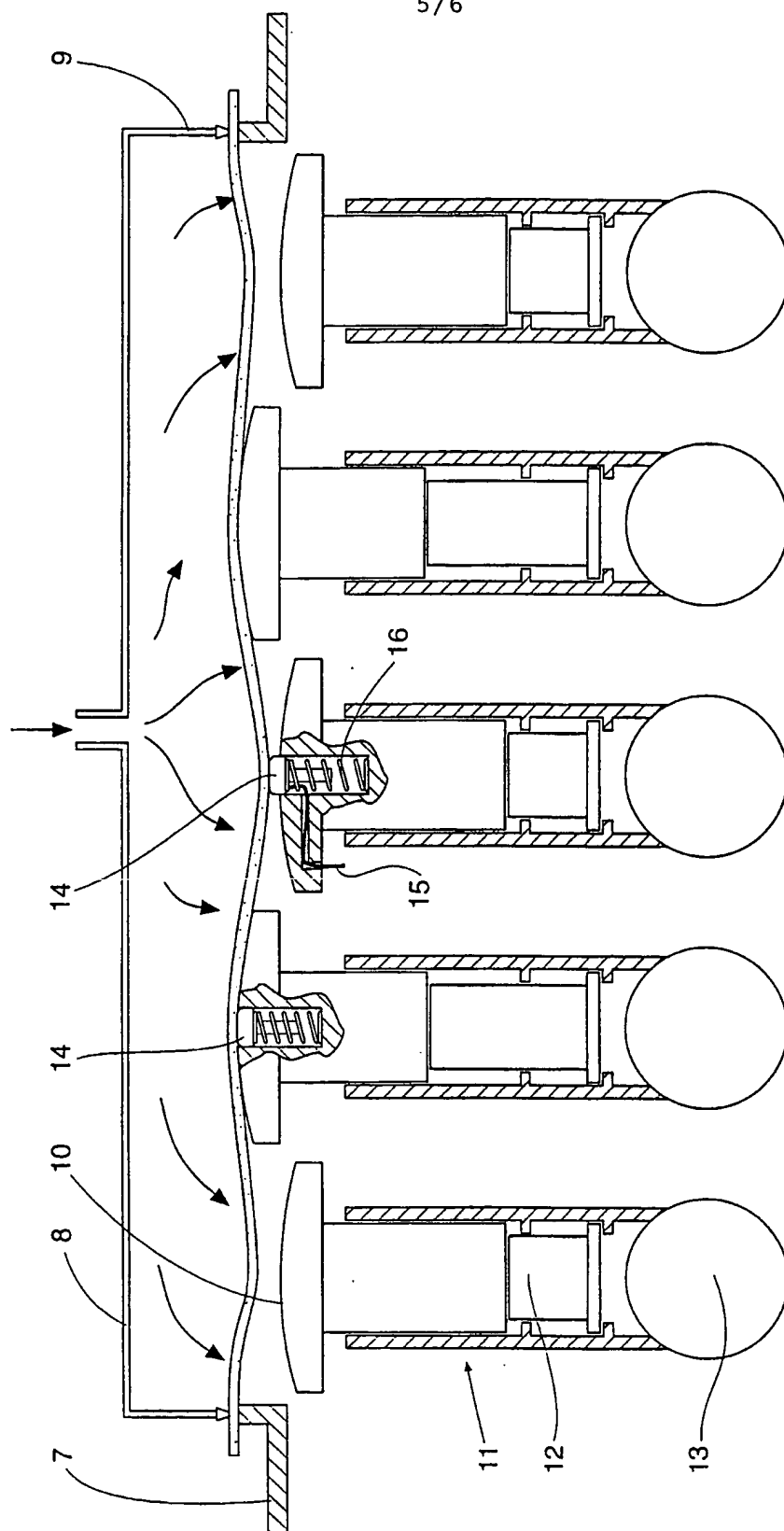
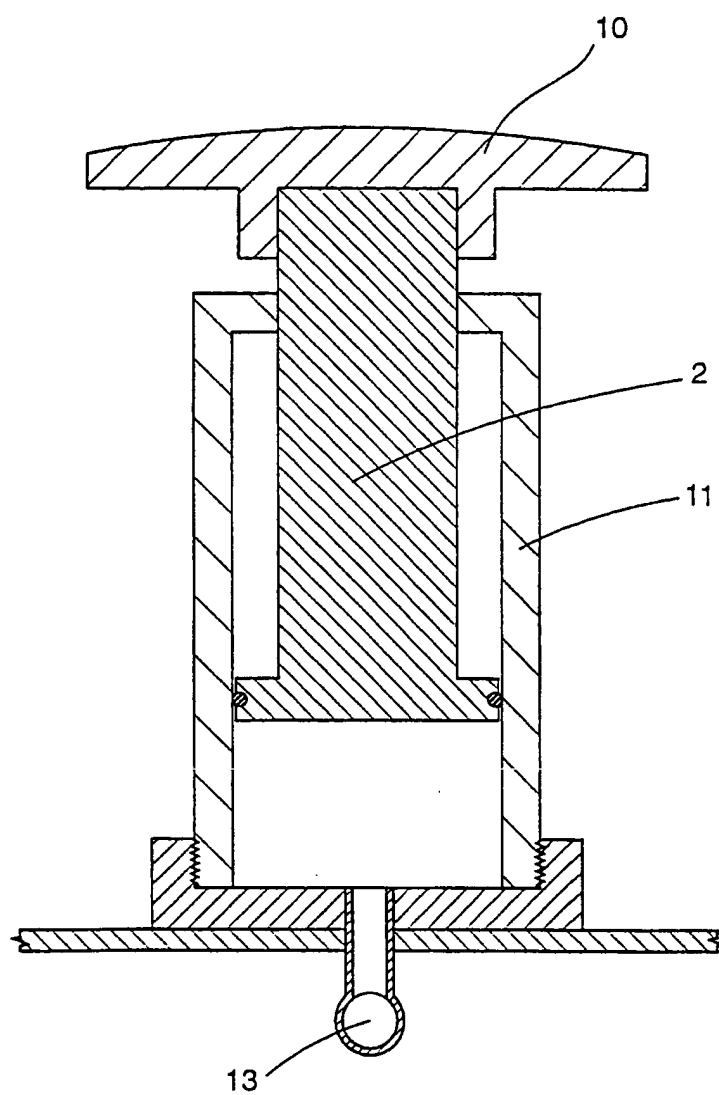


FIG 5

**FIG 6**

## INTERNATIONAL SEARCH REPORT

International Application No.  
PCT/AU 97/00262

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>												
Int Cl <sup>6</sup> : C14B 1/10, 1/26, 15/06, 17/04; C14C 15/00												
According to International Patent Classification (IPC) or to both national classification and IPC												
<b>B. FIELDS SEARCHED</b>												
Minimum documentation searched (classification system followed by classification symbols) IPC As Above												
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched												
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT: IPC As Above												
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>												
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.										
Y	WO,A,89-012698 (TANNING TECHNOLOGIES PTY LTD et al) 28 December 1989 Whole document	1,2,8-10										
Y	DE,A,3702478 (JOHS KRAUSE GmBH) 11 August 1988 Whole document	1,2,8-10										
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<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex												
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E" earlier document but published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E" earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed	
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"P" document published prior to the international filing date but later than the priority date claimed												
Date of the actual completion of the international search 26 June 1997		Date of mailing of the international search report <b>27 JUN 1997</b>										
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (06) 285 3929		Authorized officer  <b>BARRY SPENCER</b> Telephone No.: (06) 283 2284										

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PCT/AU 97/00262

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
DE	3930767	AU	629395	EP	442989	JP	04-501880
		NZ	235188	SU	1838425	WO	91-04343
DE	3833068	AT	90396	BR	89-07630	CN	1020474
		CZ	281561	EP	365068	EP	436600
		ES	2037402	JP	04-500979	PT	91831
		US	5291759	WO	90-03448	YU	89-1891
DE	3702478	AT	59413	BR	88-05024	CS	266348
		EP	299020	IN	168502	JP	01-502913
		US	5000017	WO	88-05828	YU	88-125
WO	89-12698	AU	640108	CN	1025632	ES	2013672
		IL	90621	NZ	229510	PT	90876
		ZA	89-04502				
END OF ANNEX							